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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/608,498	06/27/2003	Antonio Cabal	86282WRZ	8635

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EXAMINER
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GORDON, RAQUEL YVETTE

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 10/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/608,498	Applicant(s) CABAL ET AL.	
	Examiner Raquel Y. Gordon	Art Unit 2853	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 6/27/2003 (Preliminary Amendment).
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-30 is/are allowed.
- 6) ☒ Claim(s) 1-13, 15, 16 and 19 is/are rejected.
- 7) ☒ Claim(s) 14, 17, 18 and 31 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/27/2003</u> . | 6) <input type="checkbox"/> Other: _____  |

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***Preliminary Amendment Received and Entered***

This is to acknowledge the Preliminary Amendment filed 6/27/2003 has been received and entered.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 7, 19, 28, and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

For example, as recited in claims 7, 19, and 31, "A<sub>n</sub>" has no antecedent support.

Further, with respect to claim 28, the terms "the first and second stationary portions of the beam element" lack antecedent basis.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under

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the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-13, 15, 16, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Trauernicht et al. (US 20040155917A1). Trauernicht et al. teach every element of the instant claims including:

1. A liquid drop emitter comprising:
  - (a) a chamber (16), formed in a substrate (10), filled with a liquid (50) and having a nozzle (30) for emitting drops of the liquid (50);
  - (b) a thermo-mechanical actuator, extending into the chamber (16) from at least one wall of the chamber, and having a movable element residing in a first position proximate to the nozzle (§§ 0041, 0104, fig 3a);
  - (c) the movable element having a bending portion which bends when heated, the bending portion having at least one actuator opening for passage of the liquid (15, and fig 1); and
  - (d) apparatus adapted to apply heat pulses to the bending portion actuator resulting rapid deflection of the movable element to a second position, ejection of a liquid drop, and passage of liquid through the at least one actuator opening (see fig 11(b));
2. The liquid drop emitter of claim 1 wherein the liquid drop emitter is a drop-on-demand ink jet printhead and the liquid is an ink for printing image data (110);
3. The liquid drop emitter claim 1 wherein the thermomechanical actuator (15) includes a deflector layer (22) constructed of a deflector material having a high<sup>1</sup> coefficient of thermal expansion and a low expansion layer (§§ 0045, 0054, and Abstract, Ins 16-23) attached to the deflector layer, constructed of a low expansion material having a low coefficient of thermal expansion (Abstract Ins 16-23);
4. The liquid drop emitter claim 3 wherein the deflector material is electrically resistive and the apparatus adapted to apply a heat pulse includes a resistive heater formed in the deflector layer (Abstract Ins 16-23, element 22 and § 0065);
5. The liquid drop emitter claim 4 wherein the deflector material is titanium aluminide (§ 0049, In 6);

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<sup>1</sup> It is the Examiner's position layer 22 has a high coefficient of thermal expansion with respect to layer 23 since layer 23 is disclosed as having a lower coefficient of thermal expansion than layer 22 (see §§ 0045 and 0054).

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6. The liquid drop emitter of claim 1 wherein the movable element is an elongated structure having a lengthwise axis and the at least one actuator opening is substantially symmetric about the lengthwise axis (see fig 12(a) and elements 64 and 66);

7. The liquid drop emitter of claim 1 wherein the nozzle has a cross sectional area  $A_n$  for passage of the liquid, the movable element has one or more actuator openings having a total cross sectional area  $A_m$  for passage of the liquid, wherein  $A_n < A_m < 10 A_n$  (§ 0069, ln 4);

8. A liquid drop emitter comprising:

(a) a chamber (16), formed in a substrate (10), filled with a liquid (50) and having a nozzle (30) for emitting drops of the liquid;

(b) a thermo-mechanical actuator (15), having a cantilevered element (20) extending from an anchor wall (14) of the chamber and a free end (27) residing in a first position proximate to the nozzle (30);

(c) the cantilevered element (20) having a bending portion which bends when heated, the bending portion having at least one actuator opening (13, see fig 10(b)) for passage of the liquid (50); and

(d) apparatus adapted to apply heat pulses to the bending portion actuator (15) resulting rapid deflection (see abstract) of the free end (27) to a second position, ejection of a liquid drop, and passage of liquid (50) through the at least one actuator opening (see fig 1);

9. The liquid drop emitter of claim 8 wherein the liquid drop emitter is a drop-on-demand ink jet printhead and the liquid is an ink for printing image data (110);

10. The liquid drop emitter claim 8 wherein the thermomechanical actuator is a laminate (§ 0054) including a deflector layer (22) constructed of a deflector material having a high coefficient of thermal expansion and a low expansion layer (23), attached to the deflector layer (22), constructed of a low expansion material having a low coefficient of thermal expansion<sup>2</sup>;

11. The liquid drop emitter claim 10 wherein the deflector material is electrically resistive and the apparatus adapted to apply a heat pulse includes a resistive heater formed in the deflector layer (Abstract, lns 16-23, element 22, and § 0065);

12. The liquid drop emitter claim 11 wherein the deflector material is titanium aluminide (§ 0049, ln 6);

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<sup>2</sup> It is the Examiner's position layer 22 has a high coefficient of thermal expansion with respect to layer 23 since layer 23 is disclosed as having a lower coefficient of thermal expansion than layer 22 (see § 0045 and 0054).

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13. The liquid drop emitter of claim 11 wherein the resistive heater is configured to have a first resistor segment (62) and a second resistor segment (64) each extending from the anchor wall (14) and the at least one actuator opening (the curved opening at  $r_0$ ) is located between the first and second resistor segments (see fig 16);

15. The liquid drop emitter of claim 14 wherein the anchor wall of the chamber (12, 28) has an upper anchor wall portion and the upper anchor wall portion is extended along the central stationary portion (14) of the cantilevered element (20);

16. The liquid drop emitter of claim 14 wherein the thermal conductivity of the deflector material (22, 24) is substantially greater than the thermal conductivity of the low expansion material (23) and the low expansion material is removed in the central stationary portion of the cantilevered element ( $\P$  0077;

19. The liquid drop-emitter of claim 8 wherein the nozzle has a cross sectional area  $A_n$  for passage of the liquid, the cantilevered element has one or more actuator openings having a total cross sectional area  $A_m$  for passage of the liquid, wherein  $A_n < A_m < 10 A_n$  ( $\P$  0069, ln 4);

The applied reference has a common Assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

***Allowable Subject Matter***

Claims 20-30 are allowed.

Claims 14, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 31 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

***Reasons for Indication of Allowable Subject Matter***

The following is a statement of reasons for the indication of allowable subject matter. For example, as emphasized below with bold font and underlining, the following claim combinations are not taught by the art of record:

14. The liquid drop emitter of claim 13 **wherein the at least one actuator opening includes slot portions that define a central stationary portion of the cantilevered element that does not bend when the bending portion is heated;**

17. The liquid drop emitter of claim 14 **wherein the thermal conductivity of the low expansion material is substantially greater than the thermal conductivity of the deflector material and the deflector material is removed in the central stationary portion of the cantilevered element;**

18. The liquid drop emitter of claim 14 wherein the substrate further includes a heat sink portion and a third material having high thermal conductivity is laminated to the central stationary portion and brought into good thermal contact with the heat sink portion;

20. A liquid drop emitter comprising:

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- (a) a chamber (16), formed in a substrate (10), filled with a liquid (50) and having a nozzle for emitting drops of the liquid (50);
- (b) a thermo-mechanical actuator (15), having a beam element extending from **opposite first and second anchor walls** of the chamber and a central fluid displacement portion residing in a first position proximate to the nozzle;
- (c) **the beam element having bending portions adjacent the first and second anchor walls that bend when heated**, the bending portions having at least one actuator opening for passage of the liquid; and
- (d) apparatus adapted to apply heat pulses to the bending portions resulting rapid deflection of the central fluid displacement portion to a second position, ejection of a liquid drop, and passage of liquid through the at least one actuator opening.

21. The liquid drop emitter of claim 20 wherein the liquid drop emitter is a drop-on-demand ink jet printhead and the liquid is an ink for printing image data.

22. The liquid drop emitter claim 20 wherein the thermomechanical actuator is a laminate including a deflector layer constructed of a deflector material having a high coefficient of thermal expansion and a low expansion layer, attached to the deflector layer, constructed of a low expansion material having a low coefficient of thermal expansion;

23. The liquid drop emitter claim 22 wherein the deflector material is electrically resistive and the apparatus adapted to apply a heat pulse includes a resistive heater formed in the deflector layer.

24. The liquid drop emitter claim 23 wherein the deflector material is titanium aluminide;

25. The liquid drop emitter of claim 20 wherein **the beam element is an elongated structure having a lengthwise axis, a beam center equidistant from first and second anchor walls, and first and second actuator openings that are substantially symmetric about the lengthwise axis and that are substantially symmetric with each other about the beam center**;

26. The liquid drop emitter of claim 25 **wherein the first and second actuator openings include slot portions that define first and second stationary portions of the beam element adjacent first and second anchor walls, said first and second stationary portions not bending when the bending portions are heated**;

27. The liquid drop emitter of claim 26 **wherein the first anchor wall of the chamber has an upper first anchor wall portion, the second anchor wall of the chamber has an upper second anchor wall portion, and the**



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**upper first anchor wall portion is extended along the first stationary portion of the beam element and the upper second anchor wall portion is extended along the second stationary portion of the beam element;**

28. The liquid drop emitter of claim 26 wherein the thermal conductivity of the deflector material is substantially greater than the thermal conductivity of the low expansion material and the low expansion material is removed in **the first and second stationary portions of the beam element;**

29. The liquid drop emitter of claim 26 **wherein the thermal conductivity of the low expansion material is substantially greater than the thermal conductivity of the deflector material and the deflector material is removed in the central stationary portion of the cantilevered element;**

30. The liquid drop emitter of claim 26 **wherein the substrate further includes a first and second sink portions and a third material having high thermal conductivity is laminated to the first and second stationary portions and brought into good thermal contact with the first and second heat sink portions, respectively;**

31. The liquid drop emitter of claim 20 wherein the nozzle has a cross sectional area  $A_o$  for passage of the liquid, the beam element has one or more actuator openings having a total cross sectional area  $A_m$  for passage of the liquid, wherein  $A_n < A_m < 10 A_n$  ( $\S$  0069, ln 4).

The Examiner notes while some claims indicated as being allowable in this section have features that are taught by Trauernicht et al. and are thus cited. Nevertheless, since those claims either include further novel and non-obvious limitations or depend from base claims which are deemed novel and non-obvious, those particular claims are appropriately objected to only.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Raquel Y. Gordon, whose telephone number is (571) 272-2145. The Examiner can normally be reached on M Tu Th and F 8:30-6:00.

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If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. A fax number is available upon request.

Any inquiry of a general nature or relating to the status of this application or proceeding may be directed to the Examiner or Supervisor.



Raquel Y. Gordon  
Primary Examiner  
Art Unit 2853  
September 25, 2004

**RAQUEL GORDON  
PRIMARY EXAMINER**